Module 3

Impacts to Sensitive Habitats

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Module Introduction

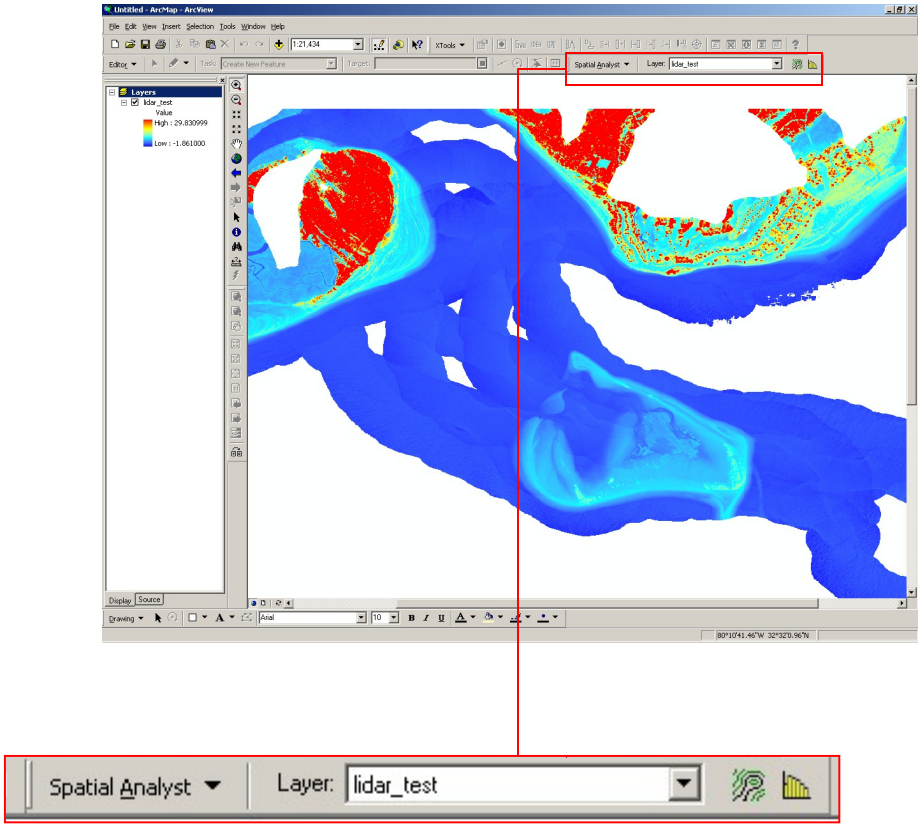
- The coastal zone is home to an increasing number of protected and/or endangered species
- These species have suffered from habitat degradation and/or loss due to increasing pressures from human population increases in coastal areas.
- GIS can be used to identify and protect these fragile coastal habitats.

Module Overview

1.	**Introduction**	Raster Data in ArcGIS, Habitat Protection, and the Study Area
2	**Exercise A**	Creating Bird Habitat Data
3.	**Lecture**	Understanding LIDAR Data
4.	**Exercise B**	Using LIDAR Data to Define a Sensitive Zone

Working With Raster Data

- **Raster data can be viewed in ArcMap; many different file types are supported**
- **The Spatial Analyst extension is needed to work with raster data**
  - Derive information
  - Identify spatial relationships
  - Find suitable locations
- **ArcToolbox contains tools to convert various data formats to raster**



GIS and Habitat Protection

- GIS can be used in habitat protection to
  - Identify the location of a habitat
  - Delineate a protected or sensitive zone surrounding a known habitat
  - Determine proximity of habitat to adverse environmental factors

- Datasets that are useful for a GIS analysis involving habitat protection in the coastal setting include
  - Bathymetry data
  - Elevation data
  - Landuse/Landcover data
  - Hydrology

- In most cases, field data collection is needed to accurately identify a habitat location.

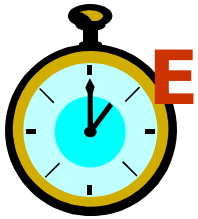
Deveaux Bank Heritage Preserve

- Lies at the mouth of the North Edisto River in Charleston County
- Part of a dynamic barrier island system
- Composed of marine grassland community
- Established to protect significant nesting habitat of seabirds and shorebirds
- Supports colonies of nesting water birds
- Accessible only by boat, but closed to the public during breeding season (April 1 to October 15)

Exercise A: Creating Bird Habitat Data

What to Expect:

In this exercise, you will use an aerial photograph as a basemap to digitize the nesting locations of two bird species on Deveaux Bank. Next, you will calculate the minimum spatial nesting requirement for each species and use this to create a buffer around each nesting location. Finally, you will determine the total spatial nesting area for each species.



Estimated Length: 45 Minutes

Discussion: Spatial Data Creation

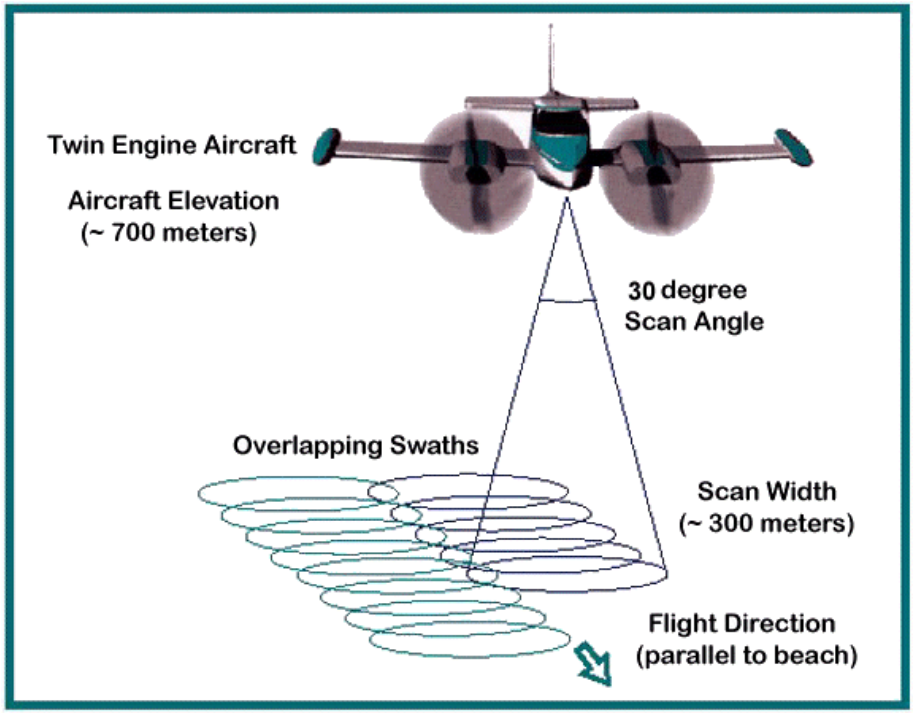
- *What other data sources would be useful*

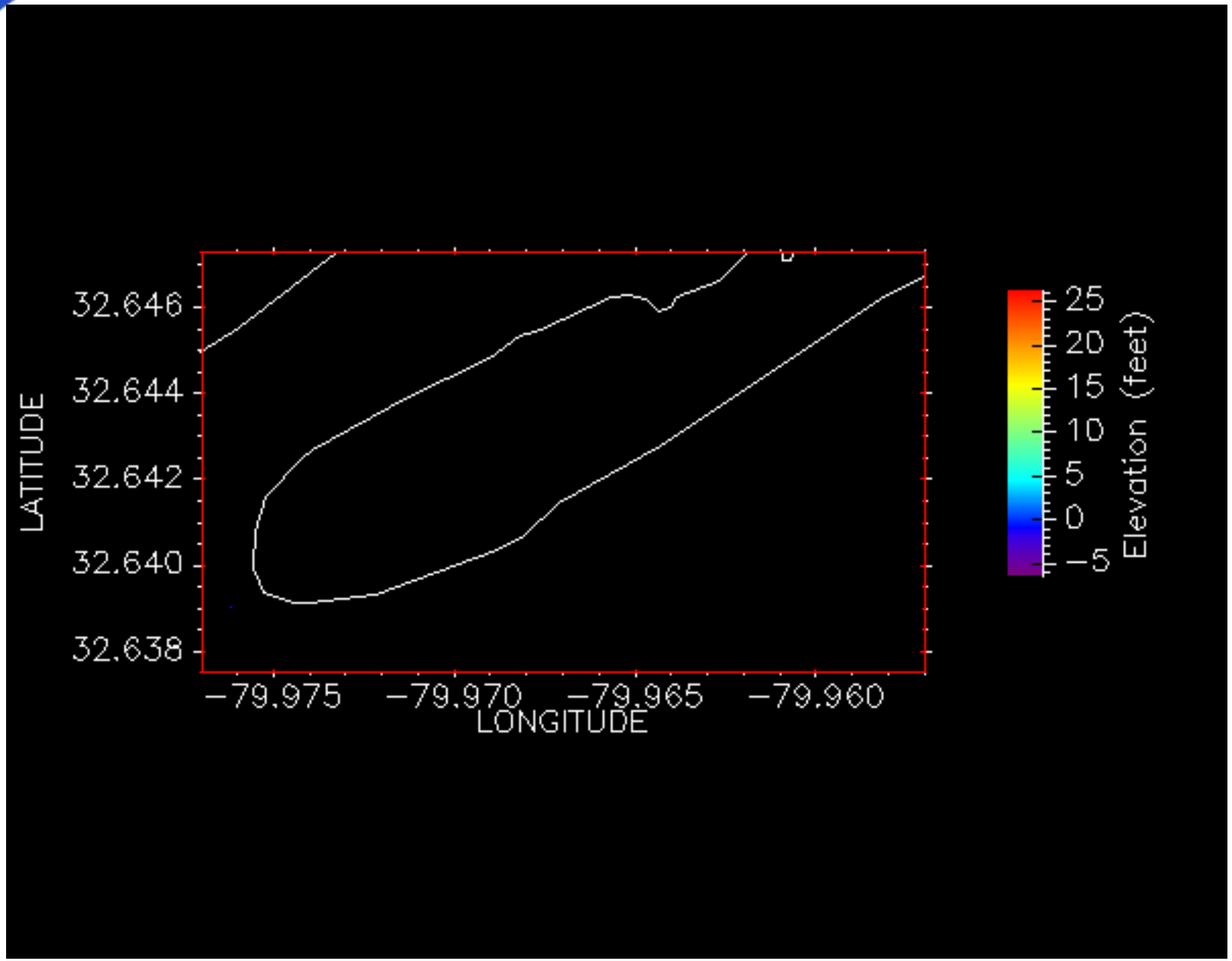
  as a base layer for digitizing data?

- *Can you think of any other methods for spatial data creation besides heads-up digitizing?*

Introduction

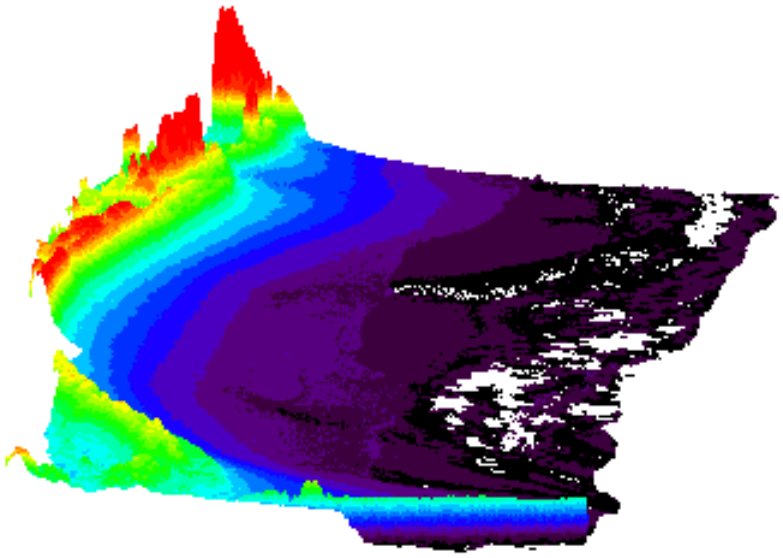
- **LIght Detection And Ranging**
- **A remote sensing technology used to collect topographic data**
- **Data are collected with an aircraft-mounted laser system**
- **The data used in this module were collected by NASA's Airborne Topographic Mapper (ATM)**
- **The ATM collects 3,000 to 5,000 spot elevations per second**
- **Researchers have been able to survey beach elevations to a vertical accuracy of ± 20 centimeters**




32.646
32.644
32.642
32.640
32.638
LATITUDE
−79.975
−79.970
−79.965
−79.960
LONGITUDE
25
20
15
10
5
0
−5
Elevation (feet)

Applications

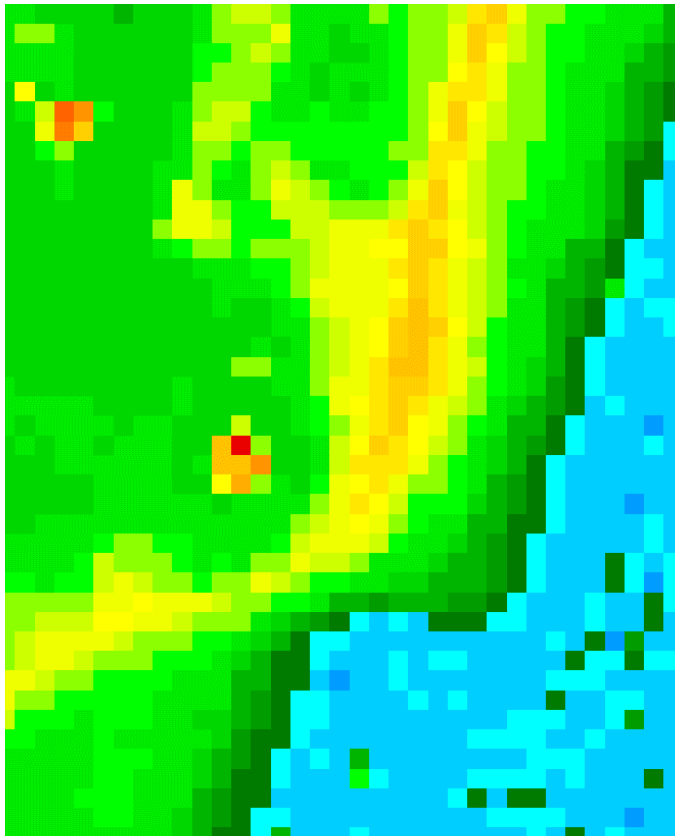
- **Can be used in any application where detailed topographic information is needed:**
  - Floodplain mapping
  - Erosion monitoring
  - Hurricane and severe storm impacts
  - Endangered species habitat suitability
- **Ideally suited for small study areas**
- **Care must be taken to ensure that the LIDAR data are collected at the appropriate times and processed in the correct manner for the desired use.**



LIDAR Data Formatting

Grids

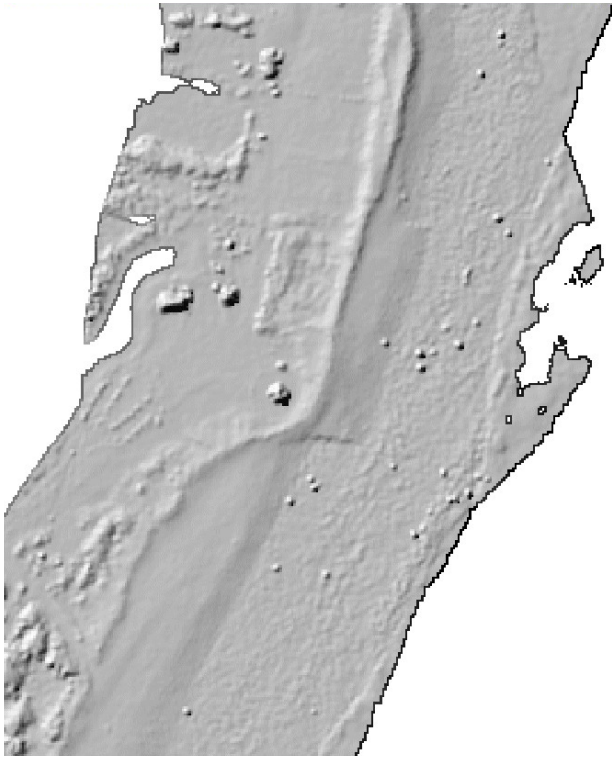
- Created by binning the raw elevation data onto a regularly spaced grid
- Grid size is an important parameter
- Less accurate than raw point data
- Easier to work with and visualize
- Usually make a more realistic representation of the actual land surface.



LIDAR Data Formatting

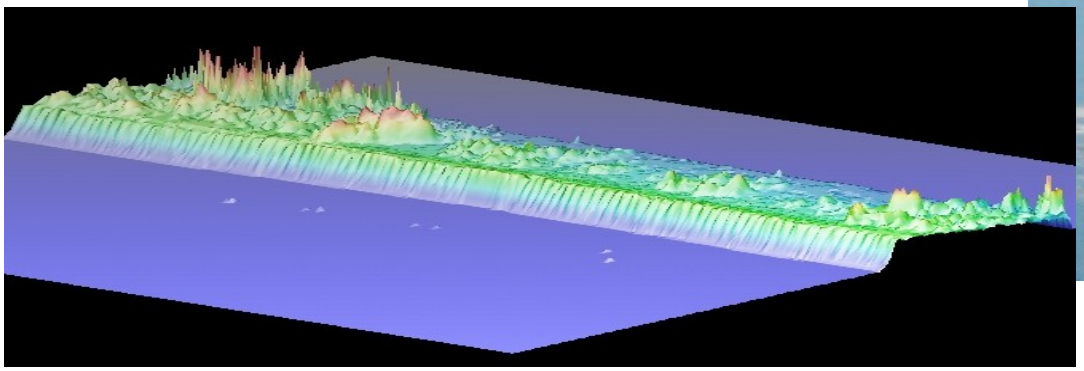
Hillshade

- A technique where the brightness of the scene is first calculated as if it were illuminated by a light source
- Creates a grid with highlights and shadows and appears to show the 3-D nature of the data
- The hillshade field in the attribute table also can be used as a brightness field for other color schemes to give a color, 3-D look to the data

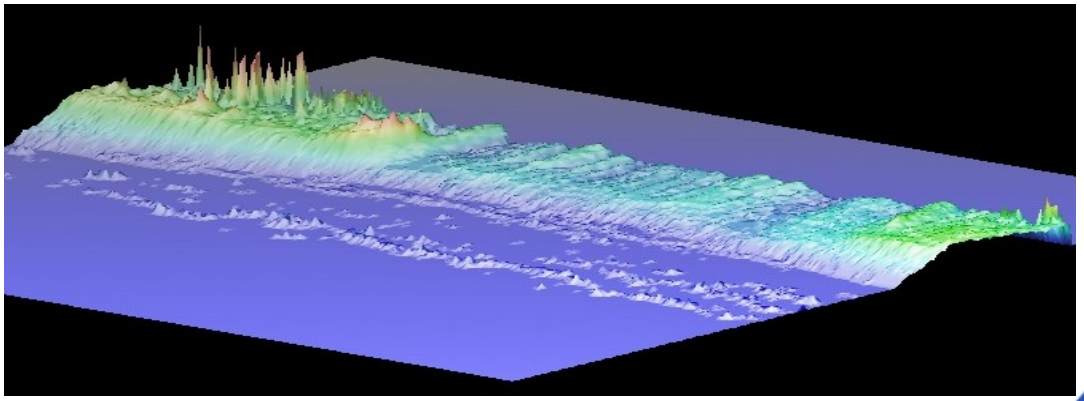


Uses: Visualization

Assateague Island, Virginia



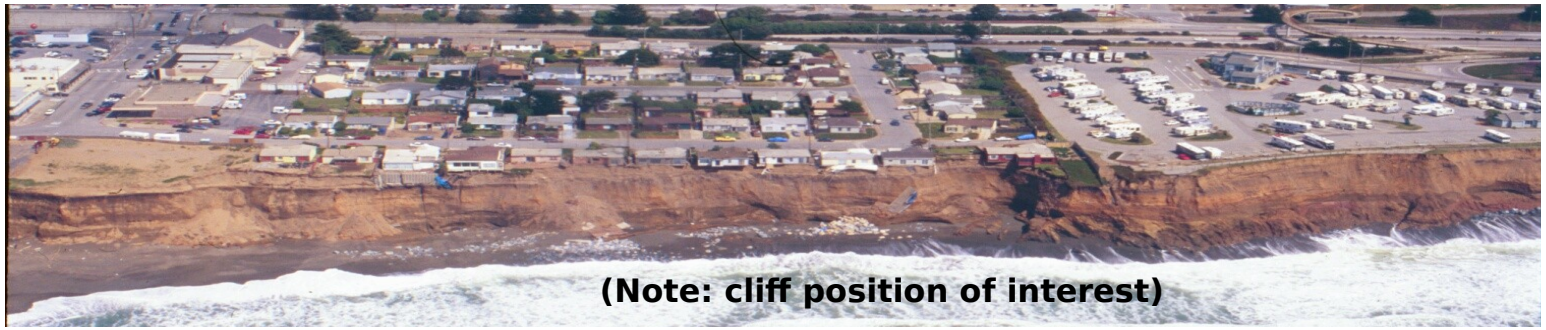
Pre-storm – September 15, 1997



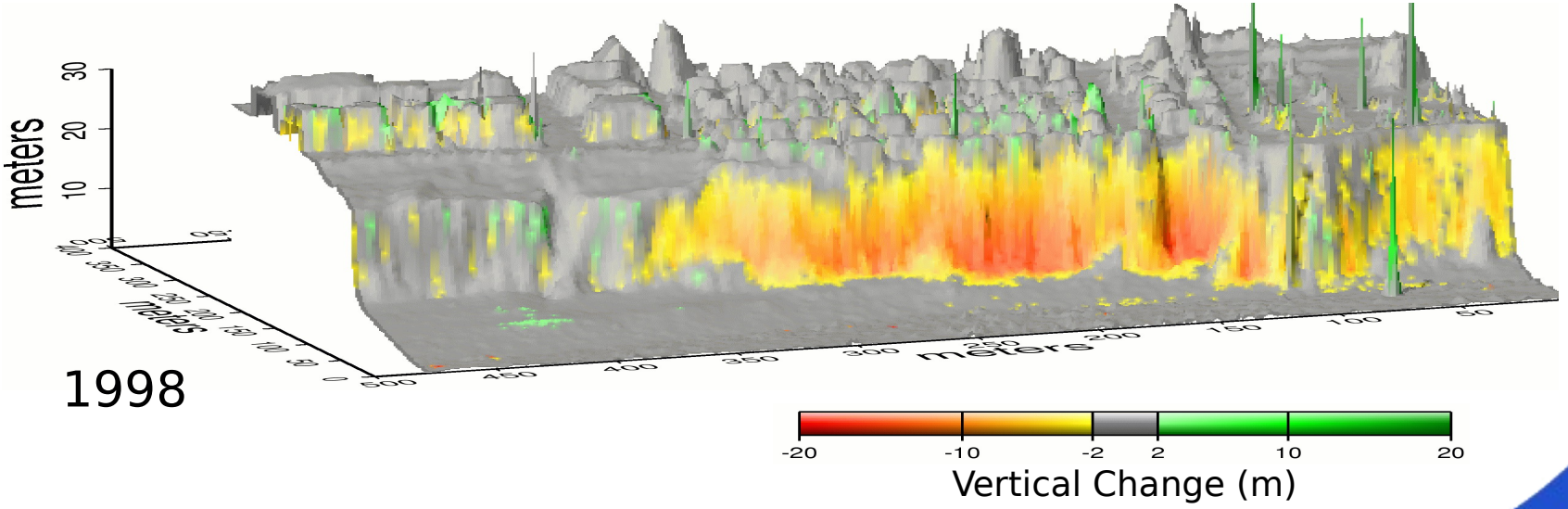
Post-storm – February 10, 1998

Uses: Local Erosion

April 1998:
Post-El Niño Oblique Aerial Photo

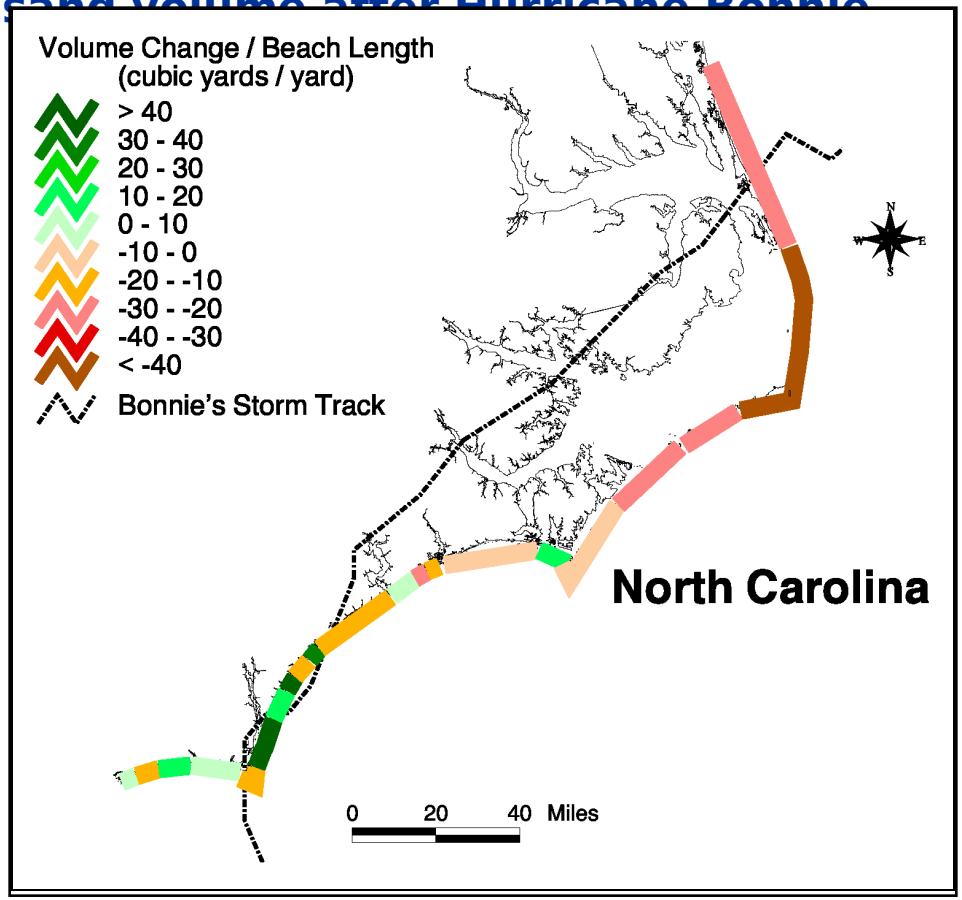


(Note: cliff position of interest)



Uses: Statewide Dynamics

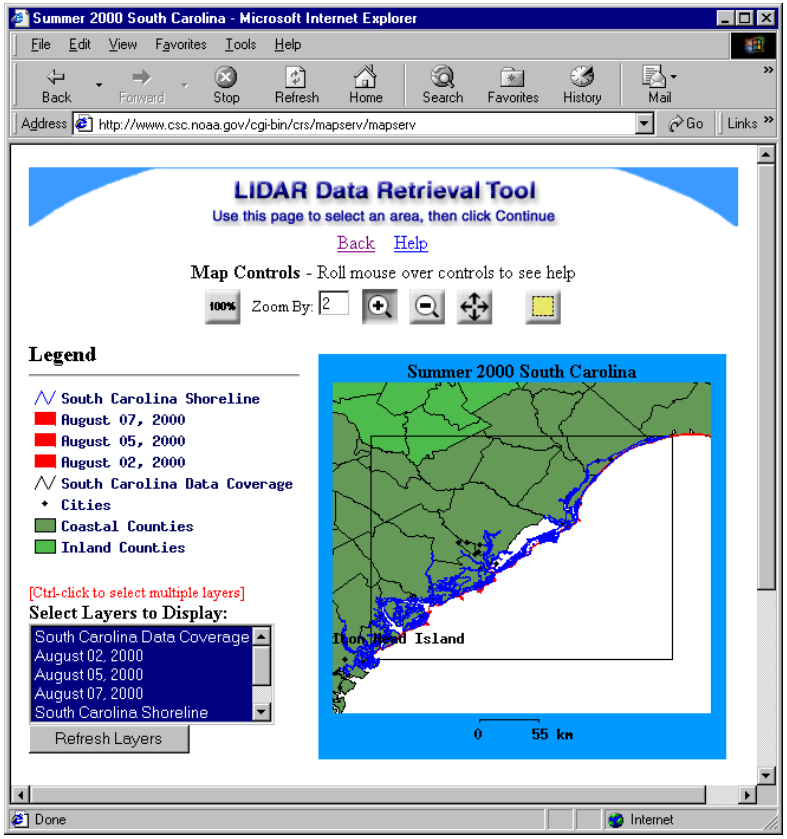
LIDAR data also are useful for larger study areas, such as the impact of Hurricane Bonnie along the entire North Carolina coastline. The impact on North Carolina's coast was examined volumetrically. Most of the areas were severely eroded, although there were also pockets of accretion. Some areas had undergone renourishment since the 1997 survey and showed a gain in sand volume after Hurricane Bonnie.



LIDAR Data Acquisition

- **The LIDAR DAta Retrieval Tool -** ***www.csc.noaa.gov/ldart/***

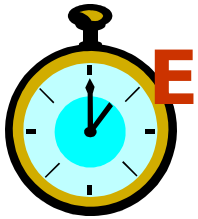
- **The LDART user interface is comprised of three Web pages:**
  - The first page prompts the user to enter an e-mail address and (the first time) name and organization, which are optional fields
  - The second page allows the user to define boundaries and choose survey dates
  - The third page provides options for the projection, datum, and file format information



Exercise B: Using LIDAR to Define a Sensitive Zone

What to Expect:

In this exercise, you will import raw LIDAR data into ArcMap using ArcToolbox. Next, you will use Spatial Analyst to analyze the data and create contours. Finally, you will use these contours to define a sensitive area where the eastern brown pelican is most likely to nest.



Estimated Length: 30 Minutes

Discussion: Understanding Visitor use Impacts

- *List other data layers that would help you determine how visitor use might impact nesting habitat.*

Discussion: Overview of Management Appiications

- *Could you use this information to convince your manager that signs would be a good strategy?*
- *How many educational signs would you place on the island?*
- *What other information would you include on the signs?*